Implementing

Implementing a predictive maintenance program: One small step at a time

Start small.

That's the key to successfully implementing a predictive maintenance program, according to Ted Helmer, Central Maintenance Superintendent for Georgia Gulf Corporation.

"At first, concentrate on a block of equipment where you can see appreciable results. Don't try to solve all the mechanical problems on rotating machinery at once," advises Helmer, who has supervised the Plaquemine, Louisiana, facility's predictive maintenance program for 10 years.

Advantages of starting small

According to Helmer and other companies interviewed by the *Orbit*, starting small has three main advantages. It enables you to:

- Refine the program in small segments—small problems are easier to solve than large ones.
- Build confidence and support of the program among production and maintenance personnel as well as management.
- Achieve the program's expected results.

Several steps are involved in starting small and launching your predictive maintenance program. These steps are designed to help make your program more manageable—and successful—in the long run.

The steps commonly followed in implementing a predictive maintenance program are:

Establish your team

The first step is establishing your team and team leader. The team members must understand the program's overall objectives and budget and labor restraints. Based on the overall plan, they participate in developing:

- The organizational and operational responsibilities.
- Program for procedures and documentation.
- Training program for learning the procedures and understanding the operation of rotating machinery information instrumentation.

Review machinery performance history

A review of the machinery performance history becomes the cornerstone for implementing a predictive maintenance program.

The review should include the types of failures that have occurred on each machine, how often these failures are experienced, and an estimate of if and when the failures are likely to occur again. Table 3, "Machine Performance History," is designed to aid you in charting the performance history.

The information you gather in compiling the machinery history assists you in deciding the first machinery to incorporate in the program.

Generally, it's recommended that problem machinery and critical machines be incorporated first into the program. These are machines that need attention to solve frequent mechanical problems or machines that interrupt production when they fail.

Determine information needed on each machine

Now that you've completed the machinery performance history, the next step is to identify the information that's required from each machine to monitor its mechanical condition.

Based on the machinery performance history in Table 3, you are now ready to determine for each machine:

- Operating mode for monitoring and acquiring machinery information.
- Type of measurement.
- Measurement limits or tolerances.
- How often measurements should be collected.

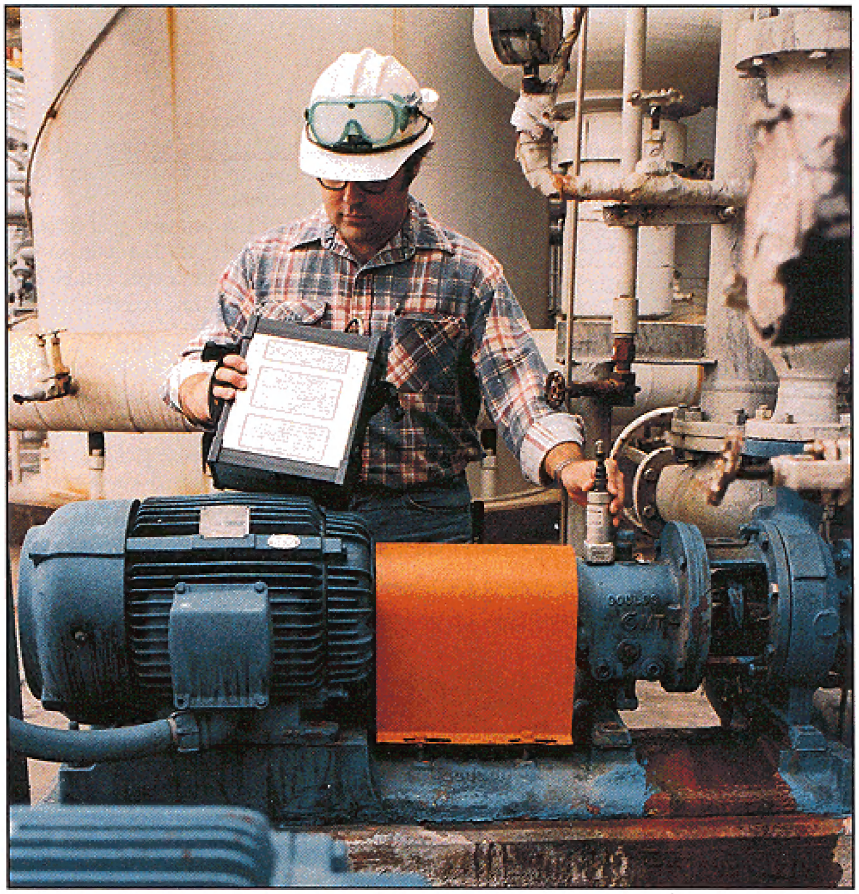


Table 4, "Machinery Information Needed," will assist you in documenting these points for each machine.

Once you know which machines to incorporate into your company's predictive maintenance program and the type of information required, you can set up procedures for on-line monitoring and periodic monitoring of your rotating machinery.

Set up an on-line monitoring program

In setting up a predictive maintenance program for on-line monitored machinery, the following points should be considered:

- Type of information needed, such as overall values, values exceeding alarm limits, steady-state dynamic vibration data, and transient dynamic vibration data.
- How often data should be trended, such as every 24 hours, one week, four weeks, etc.

"Implement a predictive maintenance program in small steps...Small problems are easier to solve than large ones."

- Who is responsible for collecting and reducing overall values and trends.
- Who is responsible for analyzing the data.
- Who is responsible for determining whether dynamic vibration data should be collected.
- Who collects, reduces, and analyzes dynamic vibration data. ►

Set up the survey route for periodic monitoring program

Setting up the route for periodically monitored equipment involves three steps:

- Giving each machine an identification number.
- Identifying the locations where the transducer should be placed on each machine.
- Mapping out the route.

Logical equipment identification numbers that have meaning, rather than random sequential numbers, are recommended. The Public Utilities Department at the City of St. Petersburg, Florida, uses a seven-digit code, XXXX.XXX, for identifying the rotating machinery at its waste water treatment facilities.

The first digit denotes the plant number. The second digit defines the area within the plant. The third and fourth digits define the major type of equipment classification, such as settling vessels and reaction vessels. The last three digits define the type of equipment within the major classification.

Identifying the transducer locations is essential in getting consistent measurements every time the machine is surveyed. Some methods for ensuring consistent measurements include:

- Painting placement marks on the machine.
- Placing a tag on the machine that contains a diagram of the machine and indicates where the transducers should be placed.
- Mounting transducer bases on the rotating machinery for use when taking measurements.

Efficiency is the primary goal in mapping out the survey route. The route should be set up so that accurate data can be collected in the shortest time possible.

Develop communications procedures

A wide range of people within an organization participate in a predictive maintenance program. Consequently, procedures must be established for communicating among the team members and departments.

Some questions that should be addressed in setting up communications procedures include:

- How should each person, by job function, communicate information on machine condition within his department and to other departments who need the machine information to fulfill their job responsibilities?
- Who initiates a maintenance work order and what departments need to be notified that a work order has been written?
- Who schedules maintenance work and how are other departments notified of the maintenance schedule?
- Who is notified when maintenance work is completed? And who is responsible for the notification?
- Who requires a report summarizing the problem and solution when maintenance work is completed? And who is responsible for the report?

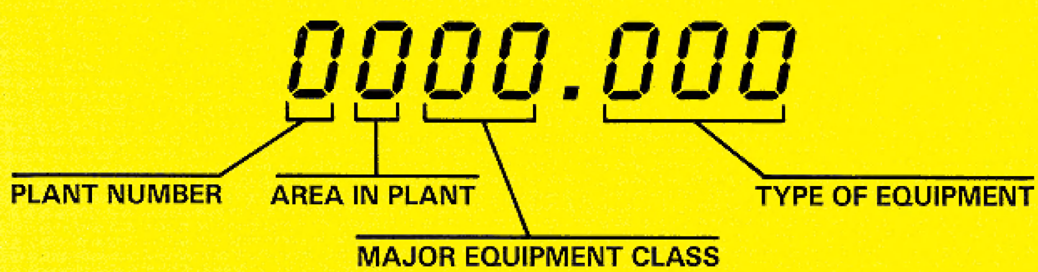
Document the program's progress

Implementation is not complete without documenting the progress of the program. "Documentation is one of the most important components of a successful vibration monitoring program," reports Howard Maxwell of Arizona Public Service Company in an August, 1985, *Power* magazine article.

"The most important documentation is the (monetary) savings from each corrected vibration problem. This continued documentation is essential to justify the program's budget and any expansion you are planning," Maxwell states.

The documentation should compare the cost of repairs, the amount of overtime, and the number of unplanned machine shutdowns before and after the program was implemented. Reports should be presented to production and maintenance personnel as well as management at regularly scheduled time periods.

The reports help build confidence and support for your program. They enable personnel involved in the program to see the results of their work, and management to see the return on investment in the predictive maintenance program. ■



Sample of Equipment Identification Numbering System

Table 3: Machine Performance History

Machine Description	Types of Failures	Frequency of Occurrence	Estimate of If and When Failure Will Occur Again
ID #			
Description			
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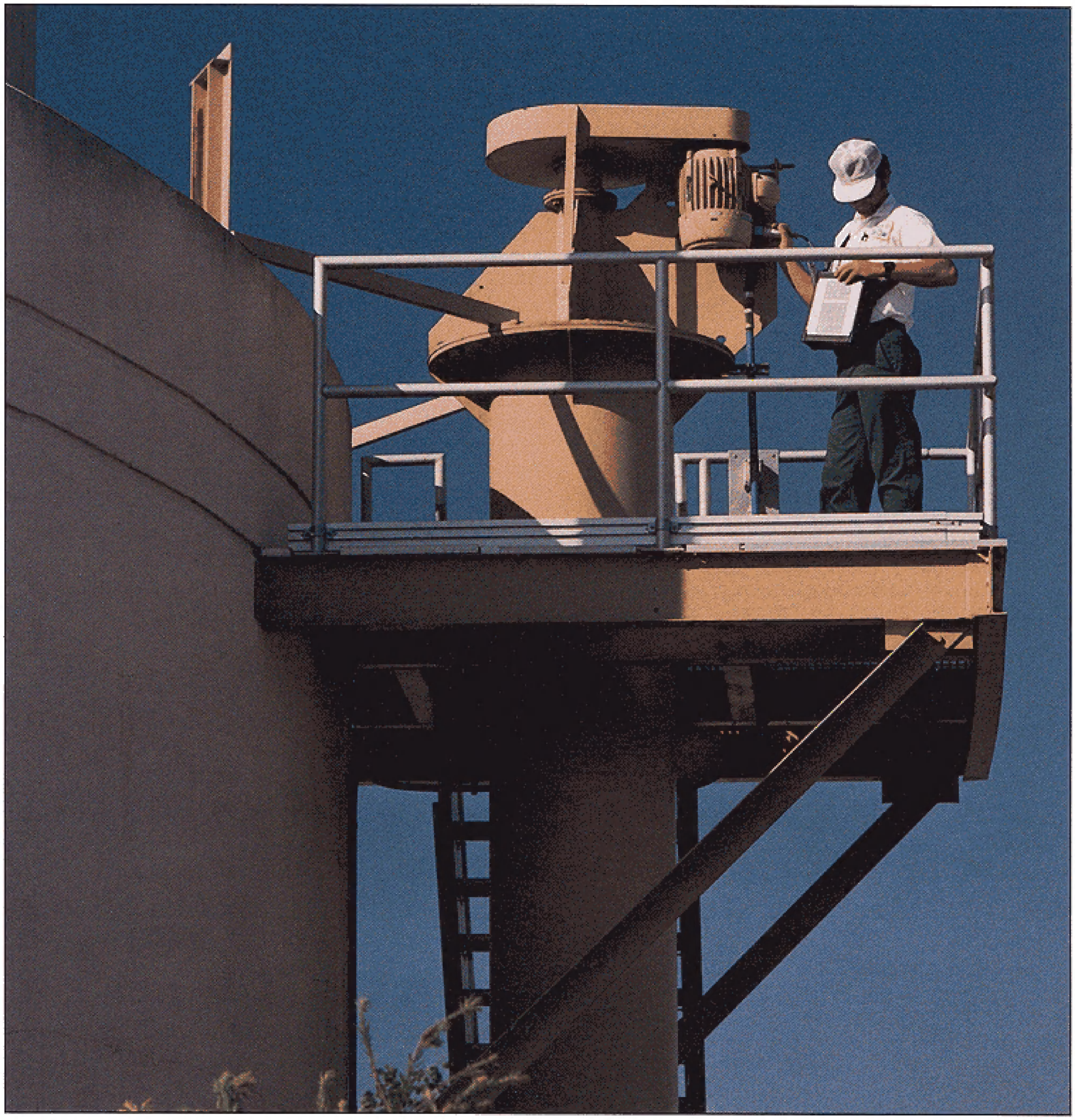

"The Public Utilities Department at the City of St. Petersburg, Florida uses logical equipment identification numbers for surveying rotating machinery at its waste water treatment facilities."

Table 4: Machinery Information Needed

Process/Survey: ______________________________

Machine/Equipment ID# and Description	Class (C,E,GP)	Operating Mode (OM,PM,SS,N)	Type of Measurement (P,A,V,T,O)	Frequency of Measurement	Measurement Limits And Tolerances

Legend:

C: Critical **E:** Essential **GP:** General Purpose

OM: On-Line Monitored **PM:** Periodically Monitored **SS:** Startup/Shutdown Mode **N:** Unmonitored

P: Proximity Probe **A:** Acceleration Transducer **V:** Velocity Transducer **T:** Temperature **O:** Other ______________________

For more information on selecting the proper transducer system, please consult your local Bently Nevada Sales Representative.

Three Bently Nevada Applications Notes are also available that explain the considerations in detail for determining the types of measurements and operating modes for acquiring machinery information. To order the Applications Notes, please check the following numbers the return card:

☐ Vibration Measurements—Basic Parameters for Predictive Maintenance on Rotating Machinery, AN038

☐ Machinery Protection Systems, Part 2, AN020

☐ Machinery Protection Systems, Part 3, AN021